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Magnetic and spectral properties of the multisublattice oxides SrY2 O4:Er3+ and SrEr2 O4

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Abstract

© 2015 American Physical Society. SrEr2O4 is a geometrically frustrated magnet which demonstrates rather unusual properties at low temperatures including a coexistence of long- and short-range magnetic order, characterized by two different propagation vectors. In the present work, the effects of crystal fields (CFs) in this compound containing four magnetically inequivalent erbium sublattices are investigated experimentally and theoretically. We combine the measurements of the CF levels of the Er3+ ions made on a powder sample of SrEr2O4 using neutron spectroscopy with site-selective optical and electron paramagnetic resonance measurements performed on single-crystal samples of the lightly Er-doped nonmagnetic analog, SrY2O4. Two sets of CF parameters corresponding to the Er3+ ions at the crystallographically inequivalent lattice sites are derived which fit all the available experimental data well, including the magnetization and dc susceptibility data for both lightly doped and concentrated samples.

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